REMARKS

Claims 7 and 14-15 have been amended to more particularly define the scope of the subject matter to be claimed.

It is respectfully submitted that the present amendment presents no new issues or new matter and places this case in condition for allowance. Reconsideration of the application in view of the above amendments and the following remarks is requested.

I. The Rejection of Claims 14-15 under 35 U.S.C. 112, Second Paragraph

Claims 14-15 stand rejected under 35 U.S.C. 112, second paragraph as allegedly being indefinite. This rejection is respectfully traversed.

To expedite prosecution, Applicants have amended claims 14-15 to recite that the fungal pectin lyase is "derived from" the particular fungus.

For the foregoing reasons, Applicants submit that the claims overcome this rejection under 35 U.S.C. 112. Applicants respectfully request reconsideration and withdrawal of the rejection.

II. The Rejection of Claims 7-20 under 35 U.S.C. 103

Claims 7-12 stand rejected under 35 U.S.C. 103 as allegedly being unpatentable over Kogya, CN 87103320, English-language translation provided by Examiner (hereinafter "Kogya") in view of Kuntz, Enzymes that Aid Beverages, Food Product Design, pp. 1-6 (1996) (hereinafter "Kuntz") and further in view of Tsai, U.S. Patent No. 4,639,375 (hereinafter "Tsai"). Claims 13-15 stand rejected as allegedly unpatentable over Kogya in view of Kuntz and Tsai and further in view of Bida, Progress in the Molecular Biological Study of Fungal Pectinases, Advances in Bioengineering, vol. 20, pp. 14-18 (2000), English-language translation provided by Examiner (hereinafter "Bida"). Claims 16-19 stand rejected as allegedly unpatentable over Kogya in view of Kuntz and Tsai and further in view of Sanderson, U.S. Patent No. 3,787,582 (hereinafter "Sanderson"). Claim 20 stands rejected as allegedly unpatentable over Kogya in view of Kuntz and Tsai and further in view of Alkorta, Immobilization of Pectin Lyase from Pencillium italicum by Covalent Binding to Nylon, Enzyme and Microbial Technology, pp. 141-146 (1996) (hereinafter "Alkorta"). This rejection is respectfully traversed.

Applicants' amended claims are directed to a method for reducing storage haze formation in a packaged tea extract, comprising contacting the tea extract with a pectin lyase; separating insoluble solids from the tea extract; and packaging the tea extract; wherein the storage haze formation is reduced by at least 10% compared to a tea extract not treated with a pectin lyase.

Kogya purports to describe a method of producing a tea drink that does not form any sediment even when stored for a long time. Kogya, Abstract. The method involves adding alcohol to the resulting processing liquor after the enzymatic processing of an extract of tea, and after solid-liquid separation, removing the alcoholic component of the separated liquor if necessary. Id., p. 1, paragraph 6. Kogya states that the enzyme is composed mainly of α-amylase and glucoamylase and pectinase. Id., p. 2, paragraph 2. Example 1 of Kogya states that when no enzyme or alcohol is used, sediment forms in seven days, and when alcohol alone is used, without added α-amylase and glucoamylase enzymes, sediment forms in three weeks. Id., p. 3, paragraphs 4-9. As the Examiner admits, nowhere does Kogya teach using the pectin lyase enzyme, let alone contacting tea extract with a pectin lyase.

In response to Applicants' prior arguments that Kogya would, at most, lead one of skill in the art to add alcohol to the resulting processing liquor after the enzymatic processing of an extract of tea, the Examiner points to Example 2, page 5, Table 2 of Kogya, and argues that the addition of alcohol is of no consequence on the influence of sediment formation. The Examiner further argues that because Applicants' claimed methods comprise various steps, this does not preclude the addition of other additives or ingredients such as alcohol.

Applicants respectfully disagree with the Examiner's conclusions regarding Kogya, and submit that the addition of alcohol in Kogya is an essential step. For example, Kogya states in the Abstract that "After an extract of tea is enzymatically processed, alcohol is added to the processing liquor" and also notes at page 1, paragraph 6 that "According to the method of the present invention, a tea drink that can be stored without forming any sediment even for a long time can be produced by adding alchohol [sic] to the resulting processing liquor after the enzymatic processing of an extract of tea". Applicants note that following the "Experimental example," Kogya states that "The above result demonstrates that the extract of tea as the raw material forms much less sediment after the enzymatic processing than without enzymatic processing." Kogya, p. 3, first full paragraph. Even this experimental example, however, requires the addition of alcohol, followed by stirring and allowing the mixture to stand, after which the sediment is separated and measured. Id., experimental example, p. 2, last paragraph. Example 12 of Kogya appears to provide a control in which no alcohol is added ("Control 2", page 7, second and third full paragraphs); however, Table 5 reports that Control 2 indicates "slight sediment formation" at two weeks and "sediment formation" at one month. Id., p. 7, Table 5. In addition, Control 3 of Table 5 provides a control where only alcohol and no enzyme is used. Kogya, p. 7, fourth full paragraph. According to Control 3, slight sediment is formed only after two

months, i.e., nearly one month and two weeks after first sediment formation when enzyme alone is used according to Control 2. Id., p. 7, Table 5. One of skill in the art would therefore conclude that alcohol is more important than enzyme and that any process would have to involve alcohol. Accordingly, nowhere does Kogya teach or suggest that the alcohol addition step can be omitted.

Moreover, nowhere does Kogya teach or suggest using pectin lyase, i.e., the particular enzyme required by Applicants' claims, let alone contacting tea extract with pectin lyase. The pectinase of Kogya and the pectin lyase of Applicants' claims represent different enzyme classes, as exhibited, for example, by their separate classifications, Kogya's pectinase as EC 3.2.1.15 versus Applicants' pectin lyase as EC 4.2.2.10. See, e.g., Applicants' specification as filed at page 2, lines 31-36 as well as the enzyme database of Expert Protein Analysis System (ExPASy) accessible at www.expasy.org/enzyme.

The Examiner further argues that Kuntz is used to show commonality between tea and fruit juice processing, that both beverages suffer from sediment problems and that pectinases such as pectin lyase are used to break down pectin in fruit juices. The Examiner states that Tsai is used to show that pectin is a constituent of tea cell walls and that pectinases are cell-wall-digesting enzymes that break down one or more cell-wall constituents into simpler materials. However, Applicants respectfully disagree with the Examiner's conclusions.

In the context of tea, Kuntz teaches that the "caffeine and polyphenols in tea complex to form insoluble complexes in cold conditions, creating the 'tea cream' seen in iced tea. Enzymatically modifying this complex with tannase increases the cold water solubility of tea solids and produces a clear tea beverage." Kuntz, p. 3, paragraph 8. The only enzyme that is mentioned in the context of tea brewing is tannase. Id., paragraphs 8-9. If anything, therefore, Kuntz teaches the use of tannase as the enzyme of choice for the enzymatic modification of teas because it is known to break up the insoluble complexes and produce a clear tea beverage.

Kuntz discloses pectinase only in the context of wine and fruit juice. Id., p. 3, paragraph 4 and p. 4, paragraphs 1-7. Specifically in the fruit juice context, Kuntz states that the pectinase is "primarily pectin methyl esterase (PME) and polygalacturonase (PG)." Id., p. 4, paragraph 4. PME is described to first remove the methyl groups of the pectin molecule and once this step is completed, PG or pectin lyase can break down the pectin polymer. Id. For juices in which a cloud (haze) is desirable, controlled breakdown of pectin is sometimes done using PG or pectin lyase. Id., paragraph 7. One of skill in the art reading Kuntz, therefore, would at best be left with the impression that in the context of fruit juice, pectin lyase and other pectin-acting enzymes can in some instances remove haze and in some instances create haze.

Tsai describes a process for the enzymatic treatment of black tea leaf, using tannase in combination with a cell-wall-digesting enzyme, such as cellulase, pectinase, papain or hemicellulase, prior to extraction. Tsai, Abstract. Pectinase enzyme is primarily expressed by its polygalacturonase activity. Id., col. 4, lines 15-22. While pectin is identified as one of several major cell-wall components (col. 2, lines 32-33), the use of pectinase is taught only in conjunction with tannase. Id., passim, especially col. 2, lines 14-19 and Examples 2-5. Again, if anything, Tsai teaches that tannase would be an essential feature in tea processing. Pectin lyase enzyme is not mentioned.

Applicants also direct the Examiner's attention to Sanderson (relied on by the Examiner in the rejection of claims 16-19). Sanderson describes the treatment of tea extracts with a pectinase enzyme preparation. Sanderson, Abstract. Pectinase activity was essentially that described for polygalacturonase. Id., col. 3, lines 8-12. Pectin lyase enzyme is not mentioned. Moreover, Sanderson further states that many of the conditions involved in pectinase enzyme treatment are "critical," including the percent of pectinase enzyme preparation that is added to the tea extract, and in fact, the "use of excessive amounts [of pectinase enzyme preparation] creates a haze problem of its own." Id., col. 2, lines 43-62, especially lines 49-53. If anything, therefore, Sanderson actually teaches away from the use of other, pectin-acting enzymes such as the pectin lyase of Applicants' claims because, in the context of the treatment of tea extracts, one of skill in the art would view such enzymes as potentially creating a haze problem rather than reducing storage haze formation.

Accordingly, even if one of skill in the art were motivated to combine the teachings of Kuntz and/or Tsai and/or Sanderson with Kogya (which Applicants do not concede to be the case), Applicants respectfully submit that none of these references, either alone or in combination, render obvious Applicants' claims.

Nor do either of Bida or Alkorta cure these defects. Bida teaches the cloning and investigation of fungal pectinase genes. Bida, Abstract. Alkorta describes the nylon-immobilization of pectin lyase and its application in fruit juices. Alkorta, Abstract. Again, none of these references teach or suggest contacting tea extract with a pectin lyase. Accordingly, none of the pending claims are rendered obvious by any of Kogya, Kuntz, Tsai, Bida, Sanderson or Alkorta, either alone or in combination.

For the foregoing reasons, Applicants respectfully submit that the claims overcome this rejection under 35 U.S.C. 103. Applicants respectfully request reconsideration and withdrawal of the rejection.

III. Examiner's Comment

The Examiner states that the phrase "untreated tea extract" of claim 7 should be clarified.

To expedite prosecution, Applicants have amended claim 7 as suggested by the Examiner.

Applicants respectfully submit that the claims fully comport with the requirements for patentable and request the Examiner's acknowledgement of the same.

IV. Conclusion

In view of the above, it is respectfully submitted that all claims are in condition for allowance. Early action to that end is respectfully requested. The Examiner is hereby invited to contact the undersigned by telephone if there are any questions concerning this amendment or application.

Please charge all required fees to Novozymes North America, Inc.'s Deposit Account No. 50-1701 at the time of electronic filing. The USPTO is authorized to charge this Deposit Account should any additional fees be due.

Respectfully submitted,

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